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| Regulation & Antitrust Policy (Econ 180) | Signature: |  |
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**QUIZ #5 VERSION A**

**"Oligopoly and Collusion"**

INSTRUCTIONS: This exam is closed-book, closed-notes. Simple calculators are permitted, but graphing calculators or calculators with alphabetical keyboards are NOT permitted. Numerical answers, if rounded, must be correct to at least 3 significant digits. Point values for each question are noted in brackets.

**I. Multiple choice:**  Circle the one best answer to each question. [2 pts each: 16 pts total]

(1) Which of the following characterizes a Nash equilibrium of a game?

1. The sum of the payoffs for both players is maximized.
2. Neither player wants to change strategies unilaterally.
3. Neither player can be made better off without the other player being made worse off.
4. Each player is receiving the highest possible payoff in the game.

(2) The Cournot model of oligopoly implies that the equilibrium price is lower

1. the fewer firms are in the industry.
2. the more elastic is market demand.
3. both of the above.
4. none of the above.

(3) Suppose a certain industry is served by a symmetric Cournot oligopoly of five firms. If the elasticity of market demand is -2, the Lerner index (or "price-cost margin") in equilibrium equals

1. 0.04 .
2. 0.05 .
3. 0.10 .
4. 0.20 .
5. 0.25 .
6. 0.50 .

(4) The Cournot model of oligopoly implies that the firm with the smallest market share will be the firm with the

1. highest price.
2. highest marginal cost.
3. lowest price.
4. lowest marginal cost.

(5) Suppose firms in a cartel use a “trigger strategy” to enforce discipline. If cheating is detected, then these firms will all

1. raise their prices.
2. lower their prices.
3. decrease their output.
4. halt production.

(6) Under U.S. law, price-fixing is illegal

1. if total market quantity is reduced significantly below the competitive quantity.
2. if significant deadweight loss can be shown.
3. if price is raised significantly above marginal cost.
4. *per se*, except in industries Congress has exempted.

(7) Under the Department of Justice’s corporate leniency program, amnesty can be given to

1. the first cartel member that cooperates with the government investigation.
2. the last cartel member that cooperates with the government investigation.
3. any cartel participants that cooperate with the government investigation.
4. any cartel participants that agree to leave the cartel.

(8) In private antitrust suits against price-fixing, injured parties can collect damages

1. multiplied by two.
2. multiplied by three.
3. multiplied by four.
4. multiplied by ten.

**II. Problems:** Insert your answer to each question below in the box provided. Use margins and graphs for scratch work⎯only the answers in the boxes will be graded. Work carefully⎯partial credit is not normally given for questions in this section.

(1) [Game theory: 12 pts] An industry consists of two firms. Each firm chooses a low price or a high price. Payoffs are shown in the following game in normal (or strategic) form.

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| --- | --- | --- |
|  |  | Firm B |
|  |  | High price | Low price |
| Firm A | High price | Firm A’s profit = $10 million Firm B’s profit = $10 million | Firm A’s profit = $1.Firm B’s profit = $15 million. |
| Low price | Firm A’s profit = $15 million.Firm B’s profit = $1 million. | Firm A’s profit = $2 million.Firm B ’s profit = $2 million. |

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| --- | --- |
| a. What strategy is Firm A’s best reply when Firm B plays “high price”? |  |
| b. What strategy is Firm B’s best reply when Firm A plays “low price”? |  |
| c. How many Nash equilibria[[1]](#footnote-1) are there in this game? Describe each equilibrium by listing the strategies played by each firm. |  |
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(2) [Oligopolist’s marginal revenue: 16 pts] Suppose a cartel of five firms (A through E) are each producing 50 units of output. Each firm’s marginal cost is $8. The market price is $30 and the slope of the demand curve is ΔP/ΔQ = -0.l . Suppose Firm A produces one more unit of output.

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| a. Will Firm A’s profit increase or decrease? |  |
| b. By about how much? (Give an answer to the nearest dollar.) | $ |
| c. Will the cartel’s total profit increase or decrease? |  |
| d. By about how much? (Give an answer to the nearest dollar.) | $ |

(3) [Collusion/joint profit maximization: 32 pts] Three firms produce a food additive. Market demand and the three firms’ joint marginal cost are shown in the graph below.

First, suppose the three firms form a cartel to maximize jointly the sum of their profits. The equation for demand is
**P = 13 – (Q/2)**, where Q = quantity in thousands.

a. Find the equation for the cartel's marginal revenue.

 MR =

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| --- | --- |
| b. Plot and label the cartel's marginal revenue curve in the graph above. |  |
| c. What price will the firms jointly set? | $ |
| d. How much output will the firms produce, in total? | thousand |
| e. Compute the amount of deadweight loss. | $ thousand |

Alternatively, suppose the three firms engage in price competition.

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| f. Compute competitive equilibrium market price. | $ |
| g. Compute competitive equilibrium market quantity. | thousand |
| h. Compute the amount of deadweight loss. | $ thousand |

(4) [Cournot duopoly: 20 pts] Suppose Firm A and Firm B form a Cournot duopoly in the market for a type of computer chip. Each firm has a constant marginal cost of **$3**. The market demand for this chip is given by the following equation:

P = 15 – (Q/20) = 15 – ((qA+qB) / 20).

Suppose Firm A has committed itself to producing qA chips.

a. Give the equation for Firm B's demand, given qA , the output of firm A.

 P =

b. Give the equation for Firm B's marginal revenue, given qA , the output of firm A.

 MRB =

c. Give the equation for Firm B's best reply function (or "reaction function"). [Hint: Set Firm B's marginal cost equal to your answer to part (b). Then solve to get qB on the left side, and an expression with qA on the right side.]

 qB =

d. Compute the quantities each firm will produce in Cournot equilibrium. [Hint: Because the firms have identical costs, you may assume symmetry (qA = qB).]

 qA\* = qB\* =

e. Compute the Cournot equilibrium price.

 P\* =

**III. Challenge question** [6 pts] Two firms, A and B, have the following marginal cost functions:

 MCA = 12 + (qA/100) MCB = 1 + (qB/50)

Suppose that a total of 1000 units of output must be produced by these two firms. Find the output allocations qA and qB that minimize the total cost of production at both firms, while insuring that 1000 = qA + qB . Show your work and circle your final answers.

[end of quiz]

1. Consider only Nash equilibria in pure (not randomized) strategies. [↑](#footnote-ref-1)